HAM4RE User Manual

DI-FCT/UNL

Contents

HAM4RE User Manual 1

Installing and running 3

Tool Specifications 5

1. Introduction

This document gives an overview of the tool developed to implement the HAM algorithm (ref a um doc para quem precisar de ver o algorítmo e method). To collect the NFAs, our HAM tool works in collaboration with the EA-Miner tool, which mines NFAs from textual (requirements) files. HAM starts by opening the Requirements Description Language (RDL) file produced by EA-Miner. RDL files are XML-style files that contain the NFAs. The HAM Tool filters the Non-Functional Aspects from the produced RDL file. We can add new NFAs to the list obtained from the RDL file, or remove NFAs from that list if we consider that there are NFAs wrongly identified by the EA-Miner. The stakeholders, architecture styles and products are elicited manually.

2. Installing and running

The installation process for the HAM Tool is very simple. Just copy and paste the HAM Tool plugin into the Eclipse plugins folder. Start Eclipse. You need to include the RDL file of the system you are assessing in the current Eclipse project.

To run the HAM Tool just right click on the RDL file, select HAM Tool and then one of the options available: HAM4RE for raking NFAs according to the opinion of a set of Stakeholders, HAM4Arch for ranking architectural styles with respect to the set of NFAs previously ranked and HAM4Products for ranking product configurations with respect to a set of NFAs.

Comment [AMM1]: Ok, this will be extended, to handle conflicts and to select features. Leave this message here to remember, please

2.1. Working with HAM Tool

For the example in this user manual, we used HAM4RE. The HAM Tool's main window is displayed in Figure 1. Considering the top-half of the window, we can observe, on the left-hand side, a tree-like structure with the goal of the assessment and the selected criteria and alternatives. In the middle of the window there is the pair-wise comparison matrix. This is where the tradeoffs between the criteria will be done. We just need to fill the right-upper side of the pair-wise matrix. The lower-left cells will be filled automatically. On the right-hand side is a matrix that will display the weights of the criteria. If the criteria weights are inconsistent, one message pop-up will warn the user. Under the pair-wise matrix we can see the Assign Value, a combo box. This component is used to assign values to the pair-wise matrix cells. In the

bottom-half of the window, we can see a short scale help, so that the user has a quick access to the scale. There is also the decision matrix, where the user elicits the importance/contributions of the alternatives to the criteria. To fill this matrix, we can use the combo box as before, or use the keyboard. Finally, on the bottom right-hand corner is the ratings matrix, where the ratings of the alternatives will be presented. The ratings are displayed in absolute percentage.

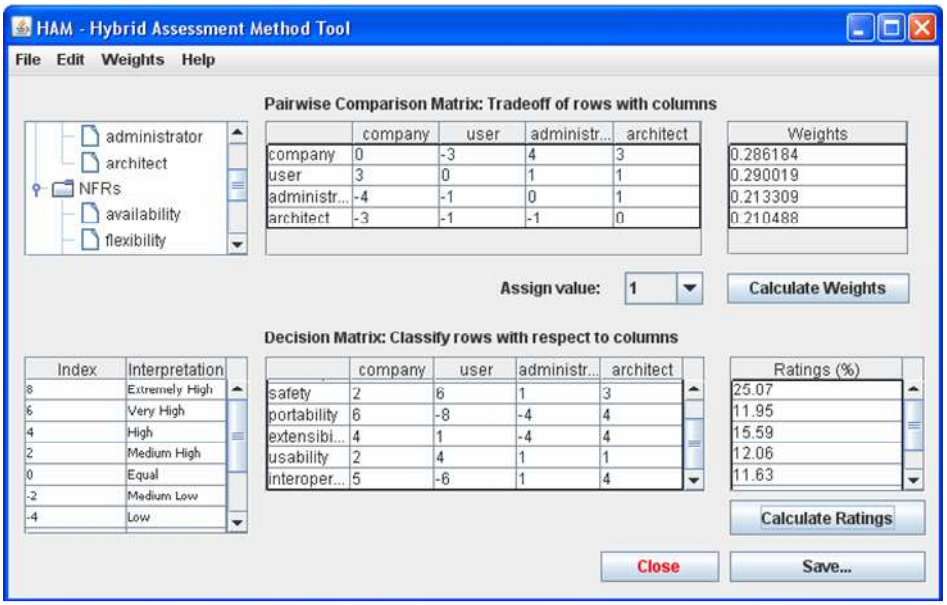

Figure 1 HAM Tool main window

To fill the pair-wise comparison matrix cells we have to:

- Select an empty cell in the pair-wise matrix;
- Use the combo box to select the value to assign to that cell.

As we said, the lower-left side of the matrix is filled automatically. When finished filling the pair-wise matrix, press the "Calculate Weights" button. You can view the criteria normalized weights (i.e., priority vector) in the weights matrix. If the consistency ratio is less than 10% the logical consistency is guaranteed, otherwise you will be prompted with an error message and you will need to adjust some values of the pair-wise comparison matrix (E. Triantaphyllou, *Multi-Criteria Decision Making Methods: A Comparative Study*.: Kluwer Academic Publishers, 2000). If the consistency value is below 10%, you will be able to start editing the decision matrix. To fill this matrix you can use the keyboard. If you consider that there is a value in the pair-wise matrix that, for some reason, you would like to change, you can edit the pair-wise matrix by doing *Edit → Matrix to fill → Pair-wise* matrix and press the

"Calculate Weights" button. To go back to editing the decision matrix, just do *Edit → Matrix to fill → Decision* matrix.
Once you are done, press the "Calculate Ratings" button. The alternatives ratings will be calculated and displayed in the ratings matrix.

You can save the results by pressing the "Save…" button, or going to *File → Save…*, which will open a save dialog. Just select the location where you want to save the project and the name of the file. This will create a new Microsoft Excel file with the name you provided, or a new sheet in the file if it exists.

After the information in the matrices is saved, the tool also allows you to add new criteria, for example a new Stakeholder, or new alternatives, for example a new NFA, to existing analysis. For instance, to add a new criterion just do *Edit → Add new criterion*. A new window opens and you can enter the name of the Stakeholder you want to add. This allows you to perform a what-if analysis. For example, it enables to see what happens if a new Stakeholder comes into play, or if a new NFA is added.

You can also use the ranking of NFAs calculated in HAM4RE in HAM4Arch, where the ratings of the NFAs in the first assessment will be their weights when ranking architectural styles.

2.2.Tool Specifications

The tool was developed in Java 1.6 using Eclipse IDE 3.4.1 to actually implement the HAM algorithm, and NetBeans IDE 6.5 to develop the Graphical User Interface.

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